LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, June 17-21, 2013.

PC PCMAG.COM IT'S A LONG WAY TO THE TOP

The Sequoia supercomputer is No. 3 on the Top500 list.

Tianhe-2, or Milky Way-2, a supercomputer developed by China's National University of Defense Technology, is the new top ranked machine on the industry-standard Top500 list of the world's most powerful high performance computing (HPC) systems.

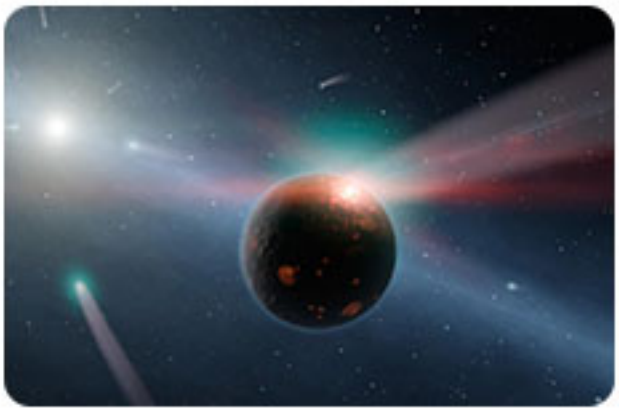
Clocked at 33.33 petaflops (33.33 quadrillion floating operations per second) on the Linpack benchmark, the Tianhe-2 dropped Oak Ridge National Laboratory's Titan to No. 2 on the list. Lawrence Livermore's Sequoia, an IBM Blue Gene/Q system, dropped to No. 3 and Lawrence Livermore's Vulcan made its first appearance on the Top500 list at No. 8. The Department of Energy and the National Nuclear Security Administration (NNSA) have four supercomputers in the top 10 of the Top500.

Sequoia, a 17.17-petaflop system that was ranked No. 1 on the Top500 from June to November of 2012, transitioned to classified computing in support of stockpile stewardship for NNSA's Advanced Simulation and Computing (ASC) program.

The U.S. remains the dominant supercomputer leader, with 253 of the 500 systems on the list. With 65 systems on the list, China ranks second, ahead of Japan, the United Kingdon, France and Germany.

To read more, go to *PC Magazine*.

LIVE SCIENCE. **ENERGIZE ME**



Comets may be carriers of the building blocks for life. Credit: NASA/JPL

The impact of comets crashing into Earth's surface may have provided the energy to create simple molecules that formed the precursors to life, a new study suggests.

That conclusion, published in the June 20 issue of the *Journal of Physical Chemistry A*, was based on a computer model of such an impact's effect on a comet crystal initially made up of water, carbon dioxide and other simple molecules.

"Comets carry very simple molecules in them," said study co-author Nir Goldman, a physical chemist at Lawrence Livermore. "When a comet hits a planetary surface, for example, that impact can drive the synthesis of more complicated things that are prebiotic -- they're life-building."

To read more, go to Live Science.

SPACE DAILY your portal to space **PLOP, PLOP, FIZZ FIZZ**

Livermore scientists have discovered a new method that may save the world's marine ecosystems by offsetting ocean acidification.

Lawrence Livermore scientists have discovered and demonstrated a new technique to remove and store atmospheric carbon dioxide while generating carbon-negative hydrogen and offsetting ocean acidification.

The team found that an electrolyte solution could absorb carbon dioxide while producing hydrogen fuel and other gases.

The researchers suggest that the carbonate and bicarbonate produced in the process could be used to mitigate ongoing ocean acidification, similar to how an Alka Seltzer neutralizes excess acid in the stomach.

To read more, go to Space Daily.

TMCnet.com VULCAN MEET INDUSTRY, INDUSTRY MEET VULCAN

LLNL's Fred Streitz and Doug East, in front of the Vulcan supercomputer.

Industry and academia are being asked to partner with Lawrence Livermore to use the Vulcan supercomputer to conduct collaborative research.

A five-petaflop (five quadrillion floating point operations per second) IBM Blue Gene/Q system, Vulcan will serve Lab-industry projects through Livermore's High Performance Computing (HPC) Innovation Center as well as academic collaborations in support of DOE/National Nuclear Security Administration (NNSA) missions. The availability of Vulcan effectively raises the amount of computing at LLNL available for external collaborations by an order of magnitude.

Six recently concluded industrial collaboration projects from Livermore Lab's initiative called the hpc4energy incubator illustrate benefits companies have realized through the application of supercomputer technologies and expertise to energy applications. Beyond these examples, the availability of Vulcan enables even larger systems to be simulated over longer time periods with greater fidelity and resolution.

To read more, go to TMC.net

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GOING DEEP UNDERGROUND

AN ERT electrode band, mounted on non-conductive casing, is prepared for installation.

Lawrence Livermore researchers have broken the record for tracking the movement and concentration of carbon dioxide in a geologic formation using the world's deepest Electrical Resistance Tomography (ERT) system.

The research provides insight into the effects of geological sequestration to mitigate the impact of greenhouse gases.

The team, led by LLNL's Charles Carrigan, obtained time lapse electrical resistivity images during the injection of more than 1 million tons of carbon dioxide (CO2) more than 10,000 feet deep in an oil and gas field in Cranfield, Miss., which represents the deepest application of the imaging technique to date.

"The images provide information about both the movement of the injected CO2 within a complex geologic formation and the change with time of the distribution of CO2 in the porous sandstone reservoir," Carrigan said.

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